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Green Infrastructure Rapid Assessment Plan: Genesee River

Monroe County, New York

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Monroe County, New York

Green Infrastructure Rapid Assessment Plan

Genesee River

January 5, 2015

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Green Infrastructure Rapid Assessment Plan

Genesee River

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Acronyms and Abbreviations

CWP	Center for Watershed Protection
GIS	geographic information system
HSG	Hydrologic Soil Group
HUC	Hydrologic Unit Code
ICM	Impervious Cover Model
NYSDEC	New York State Department of Environmental Conservation
plan	Green Infrastructure Rapid Assessment Plan: Genesee River
PWL	Priority Waterbodies List
SWAPP	stormwater assessment and action plan
TMDL	total maximum daily load
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WWTP	wastewater treatment plant

Executive Summary

This “Green Infrastructure Retrofit Plan: Genesee River” identifies and prioritizes potential stormwater retrofit projects to address existing water quality issues including the following pollutants of concern: nutrients (phosphorus), priority organics (PCBs), pesticides, pathogens, silt and sediment, aesthetics, oil and grease (NYSDEC 2003). The Genesee River study area evaluated in this assessment is comprised of two distinct subareas: the Middle Genesee subarea and the Lower Genesee subarea. The Genesee River, from the Erie Canal to the mouth at Lake Ontario, is listed as “known” impaired for beneficial uses including fish consumption and aquatic life and “suspected” impaired for public bathing. Recreation and aesthetic uses are known to be stressed (NYSDEC 2003) according to the 2001 Genesee River Basin Water Inventory and Priority Waterbodies List published in 2003 by the NYSDEC. The Genesee River is also listed as impaired in the New York State SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). This designation requires that MS4s ensure no net increase in discharges of pollutants of concern. The City of Rochester and Monroe County are MS4s located within the Genesee River watershed.

The approximately 2,487 acre study area watershed discharges into Lake Ontario, within the City of Rochester in Monroe County, New York. The sources of the water quality concerns include industrial related discharges, toxic/contaminated sediment, municipal, storm sewers and urban runoff (NYSDEC 2003). In addition, stormwater runoff volumes and rates, flooding, and hydro-modification are additional concerns because these influence nonpoint source pollutant loads as well as stream channel geomorphology and biological habitat. Potential retrofit projects are recommended structural practices aimed at reducing nonpoint source loads of stormwater pollutants such as phosphorus, reducing runoff volumes and rates and attenuating peak flows.

The expedited approach used to develop this Plan included a baseline assessment of current watershed conditions through the collection, review, and analyses of geographic information system data such as land cover, land use, land ownership, topography, stormwater infrastructure, roadways, surface water, hydrology, wetlands, and soil. In addition, background literature and reports were reviewed to understand the historical and current watershed conditions. Monroe County has employed this methodology for other Green Infrastructure Rapid Assessment Plans completed for other watersheds in the county, including Allen Creek Main Branch and Allen Creek East Branch and Northrup Creek-Long Pond.

A total of 53 potential retrofit projects are identified and ranked for the watershed study area (see Figures 1 and 2). Projects identified are located on public and private lands in areas of the watershed where they can provide water quality improvements and help control runoff volumes during flood events. The types of potential retrofits include stormwater wet ponds, bioretention and integrated bioretention areas, forested riparian buffers, and enhanced/constructed wetlands. Potential projects are ranked by applying a scoring system adopted by Monroe County that awards project points for feasibility, watershed benefits, and cost-effectiveness criteria. Monroe County developed this approach using guidance from the Center for Watershed Protection's (CWP's) Urban Stormwater Retrofit Practices, Manual 3 in their Urban Subwatershed Restoration Series (CWP 2007). Bioretention projects, specifically those within public rights-of-way adjacent to transportation routes or the University of Rochester campus ranked highest for feasibility, watershed benefits and cost effectiveness scores compared to other potential projects. Three forested riparian buffer projects, and seven bioretention /integrated bioretention areas system ranked second highest out of all projects. Three bioretention area projects on private land ranked lowest out of all projects, and three stormwater wet ponds and one constructed/enhanced wetland, located on private parcels also scored low relative to other project types.

1. Assessment Overview

1.1 Problem Statement

Like many other communities characterized by development and associated land uses and land covers, Monroe County, New York, faces water resources management challenges as a result of these practices. Land practices such as increasing land clearing, increases in impervious cover, and residential, commercial, industrial, and agricultural land uses often lead to an increase in stormwater pollutants from nonpoint source and point sources. In addition, atmospheric deposition can contribute to surface-water pollutant loading by supplying sources of nutrients to waterbody surfaces (in contact with air), although this is difficult to quantify with a high degree of certainty due to factors such as the interaction of phosphorus with soil.

Land uses (e.g., municipal and agricultural), typically introduce a range of pollutants (e.g., sediment, nutrients, metals, hydrocarbons, pathogens, pesticides, organics) that have the potential to come into contact with stormwater runoff. For instance, in urban areas the construction of roadways typically results in increases of impervious cover and fewer opportunities for stormwater to infiltrate into the ground. Residential land uses may introduce the potential for nonpoint sources of nutrients from on-site wastewater treatment systems or sanitary sewer infrastructure. Agricultural land uses often introduce potential stormwater pollutants such as nutrients (nitrogen and phosphorus) and sediment from land-disturbing activities.

As a result of these practices, hydrologic, geomorphic, water quality, and biological alteration often occur within a watershed. For instance, stormwater runoff volumes and rates typically increase as a result of increases in impervious cover. Infiltration and groundwater recharge rates may decrease as a result of more impervious cover, thus causing lower baseflows and higher peak flows. As a result, stream channels may become more susceptible to erosion and sediment loads in receiving waters can increase and lead to degraded biological habitats. Increases in impervious cover can also contribute to habitat degradation by influencing increases in temperature and decreases in dissolved oxygen of the receiving surface.

In the Genesee River watershed, reported sources of water quality pollutants include urban/stormwater runoff, and municipal and industrial sources (New York State Department of Environmental Conservation [NYSDEC] 2003). Urban land use types account for the majority of the Genesee River study area.

1.2 Purpose

This Green Infrastructure Rapid Assessment Plan: Genesee River (Plan) provides Monroe County with a prioritized list of stormwater retrofit projects for the study area, which, if implemented, are expected to improve water quality and reduce stormwater runoff volumes through time. The assessment methodology used to develop this Plan is a simplified approach of the methodology used to develop stormwater assessment and action plans (SWAPPs) for other watersheds in Monroe County. Unlike the rapid assessment approach, the SWAPP approach typically includes the development of a watershed model to evaluate baseline watershed conditions and to estimate the potential effects of proposed stormwater retrofit projects on water quality and hydrology. However, instead of watershed modeling, this rapid assessment employed a planning-level geographic information system (GIS) desktop analysis and ranking methodology that factored in estimates for project benefits, feasibility, and cost effectiveness. The results of this rapid assessment provide the groundwork for additional detailed investigations of stormwater management strategies such as those described in SWAPPs completed for other watersheds in Monroe County (e.g., Shipbuilders and Buckland Creeks).

1.3 Setting

The Genesee River study area evaluated in this assessment is comprised of two distinct subareas: the Middle Genesee subarea and the Lower Genesee subarea, both located predominately within the City of Rochester, with portions within the Towns of Greece and Brighton (Figures 1 and 2). The Genesee River forms parts of the boundary of both subareas. The Genesee River makes up the eastern boundary of the Middle Genesee subarea, which is located immediately downstream of the river's intersection with the Erie Canal and on the right bank side of the river (looking downstream) and with portions extending on to the University of Rochester's campus. The Lower Genesee subarea is located about 9 miles downstream, on the left bank of the River (looking downstream) and immediately upstream of its confluence with Lake Ontario (Figures 1 and 2).

The approximately 3.89 square mile (2,487 acres) study area is part of the "Great Lakes" defined by two, four digit Hydrologic Unit Codes (HUCs). The Genesee River is the main perennial stream within both portions of the study area and it generally flows from south to north from Pennsylvania to New York and to the City of Rochester where it discharges into Lake Ontario. The Middle Genesee portion of the study area contains portions of two, four digit HUCs: 0413: Southwestern Lake Ontario and 0414:

Southeastern Lake Ontario. The Middle Genesee portion of the study area is bordered by the Erie Canal, which forms the southern boundary of the subarea. The Lower Genesee portion of the study area resides within one, four digit HUC: 0413: Southwestern Lake Ontario.

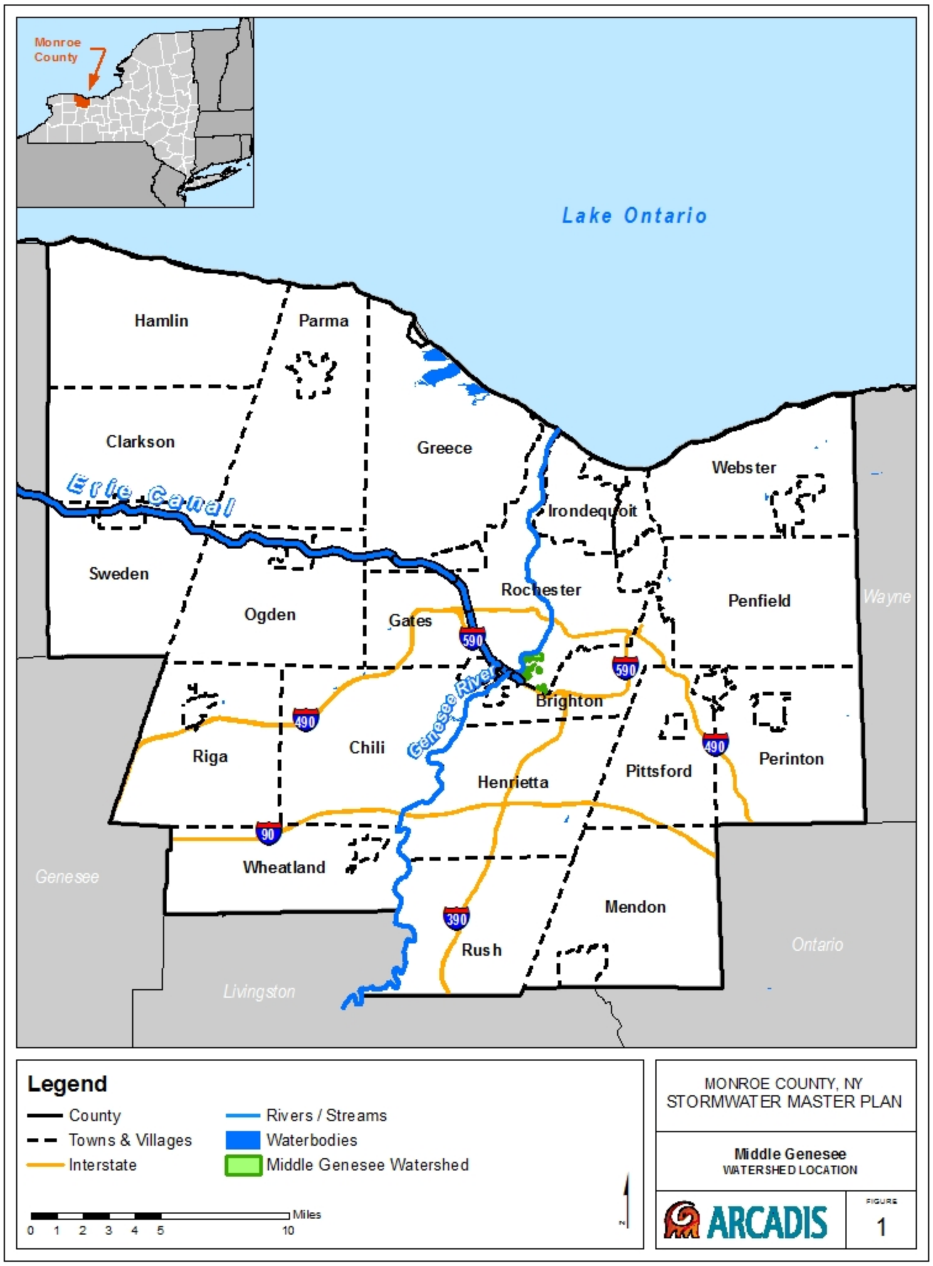

Figure 1 Location of the Middle Genesee River study area, City of Rochester, Monroe County, New York

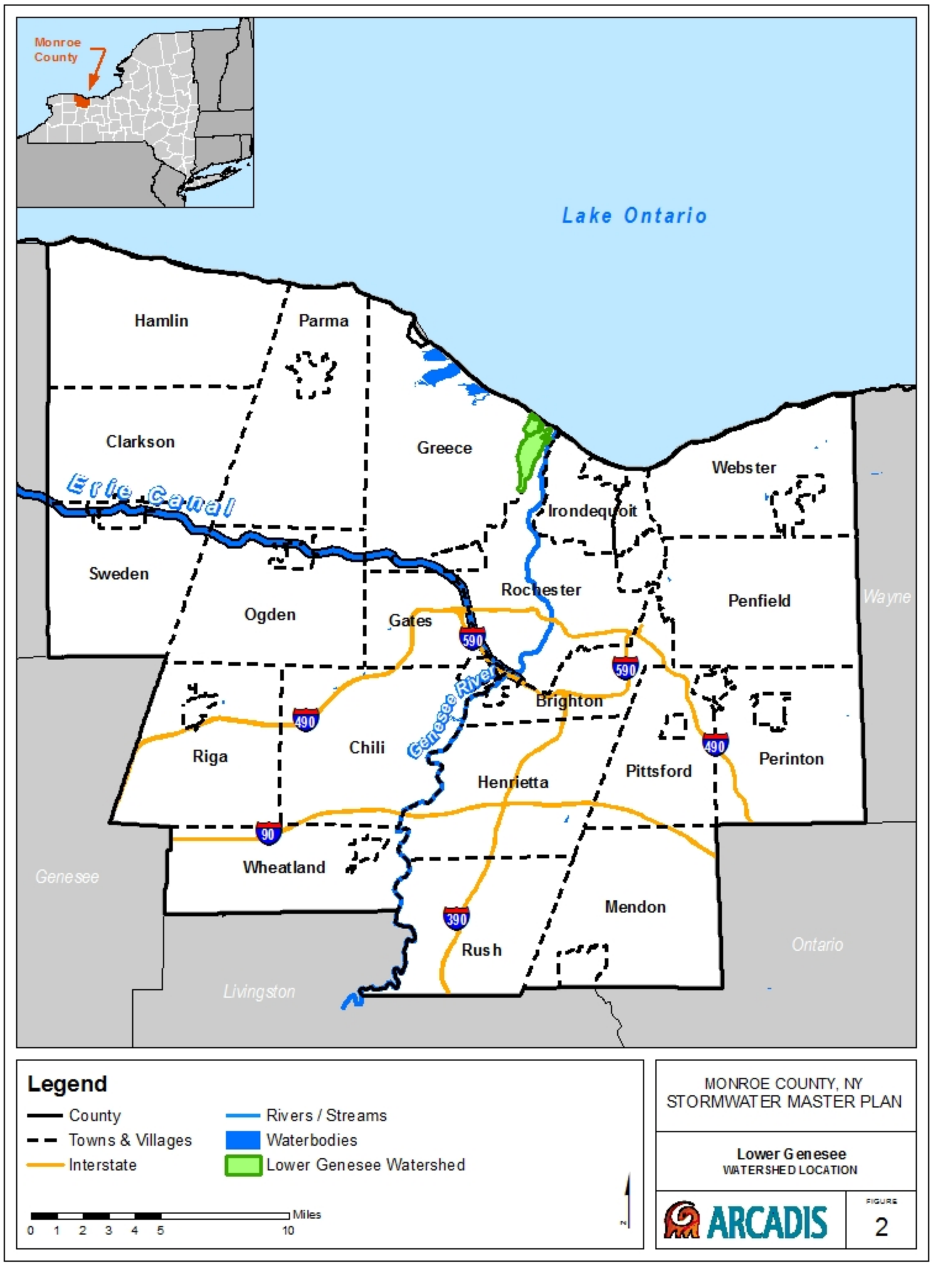

Figure 2 Location of the Lower Genesee River study area, City of Rochester, Monroe County, New York

The Genesee River study area is comprised mostly of community service and residential land uses (approximately 73%) (Table 1, Figures 3 and 4). Commercial land uses total about 15% of the study area and recreational and entertainment land uses make up about 7%. The University of Rochester (classified as community service) makes up a large portion of the Middle Genesee subarea.

Table 1 Genesee River Study Area Data

Metric	Middle Genesee River Subarea	Lower Genesee River Subarea	Total for Study Area
Area	1,177	1,310	2,487
Mapped Stream Length (miles)	0	2	2
Percent of Stream Channelized (%)	Unknown	Unknown	Unknown
Land Use			
Primary/Secondary Land Use	Community Service/Commercial	Residential /Community Service	Community Service
Agricultural land use (%)	0	0	0
Residential land use (%)	14	55	36
Vacant land use (%)	2	8	5
Commercial land use (%)	21	10	15
Recreational and Entertainment land uses (%)	1	11	7
Community Service land use (%)	54	21	37
Industrial land use (%)	1	0	1
Public Services land use (%)	4	4	4
Wild, Forested, Conservation Lands, and Public Parks land uses (%)	6	3	5
Number of Stormwater Treatment Ponds	Unknown	Unknown	Unknown
Number of Stormwater Outfalls	10	19	29
Current Impervious Cover (%)	39	65	53
Estimated Future Impervious Cover (%)	Unknown	Unknown	Unknown
Wetlands (%)	1	2	1

Table 1 Genesee River Study Area Data

Metric	Middle Genesee River Subarea	Lower Genesee River Subarea	Total for Study Area
Municipal Jurisdictions			
City of Rochester (%)	100	47	72
Town of Greece (%)	0	52	28
Town of Brighton (%)	<1	0	<1

Wetlands are sparse throughout the watershed, but one relatively large wetland area (approximately 5 acres) is located in the Lower Genesee River study subarea, downstream of and adjacent to a golf course. This wetland helps infiltrate stormwater runoff from the golf course, as well as adjacent residential land use. Wetlands, like this one, play critical roles in hydrologic, water quality, and biological processes by filtering out pollutants (e.g., phosphorus) and sediment, infiltrating stormwater runoff, and providing important aquatic habitat for fish, macroinvertebrates, and amphibians.

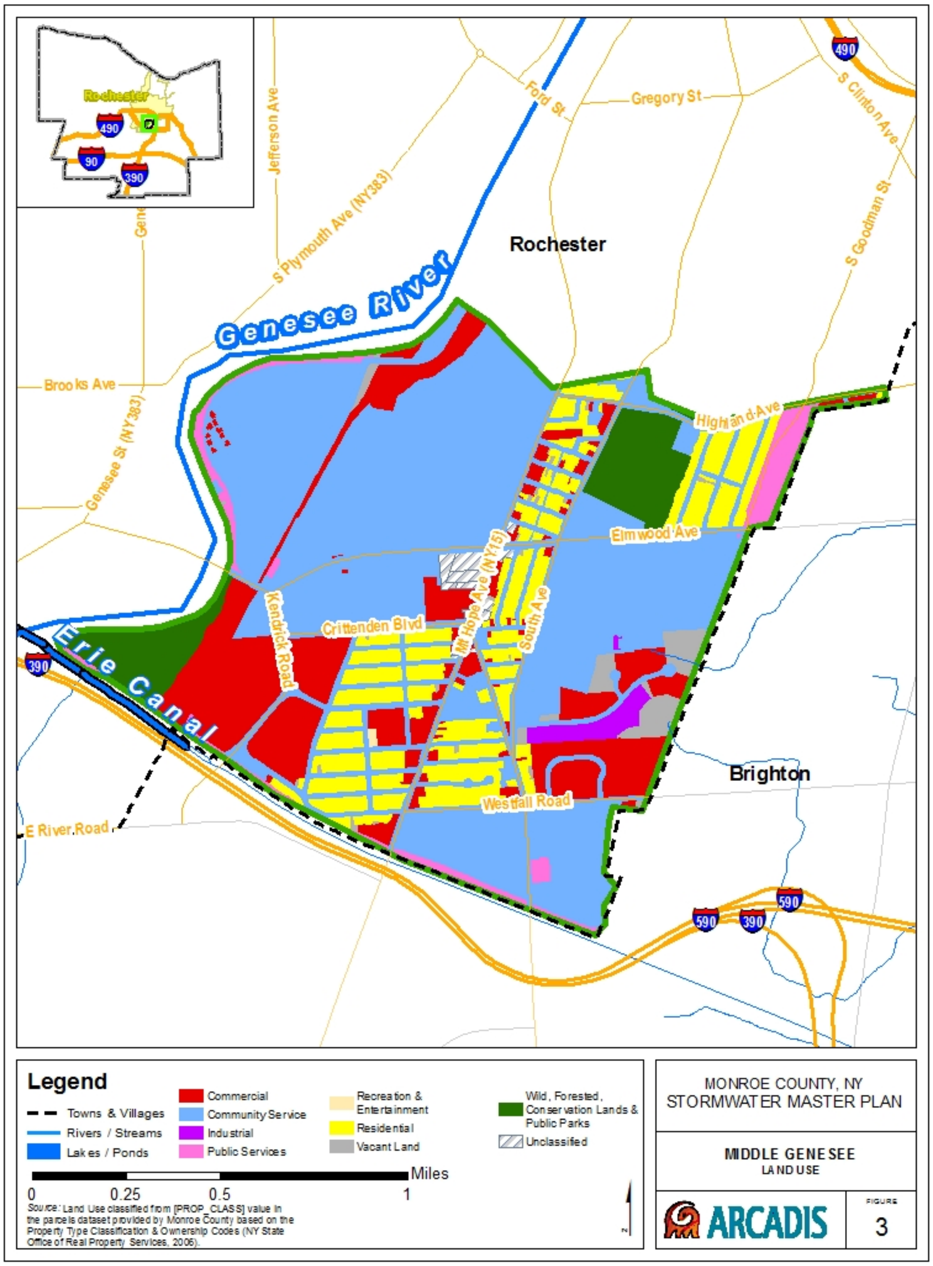

Figure 3 Land Use within the Middle Genesee River Study Subarea (Source: Monroe County Parcels GIS Dataset)

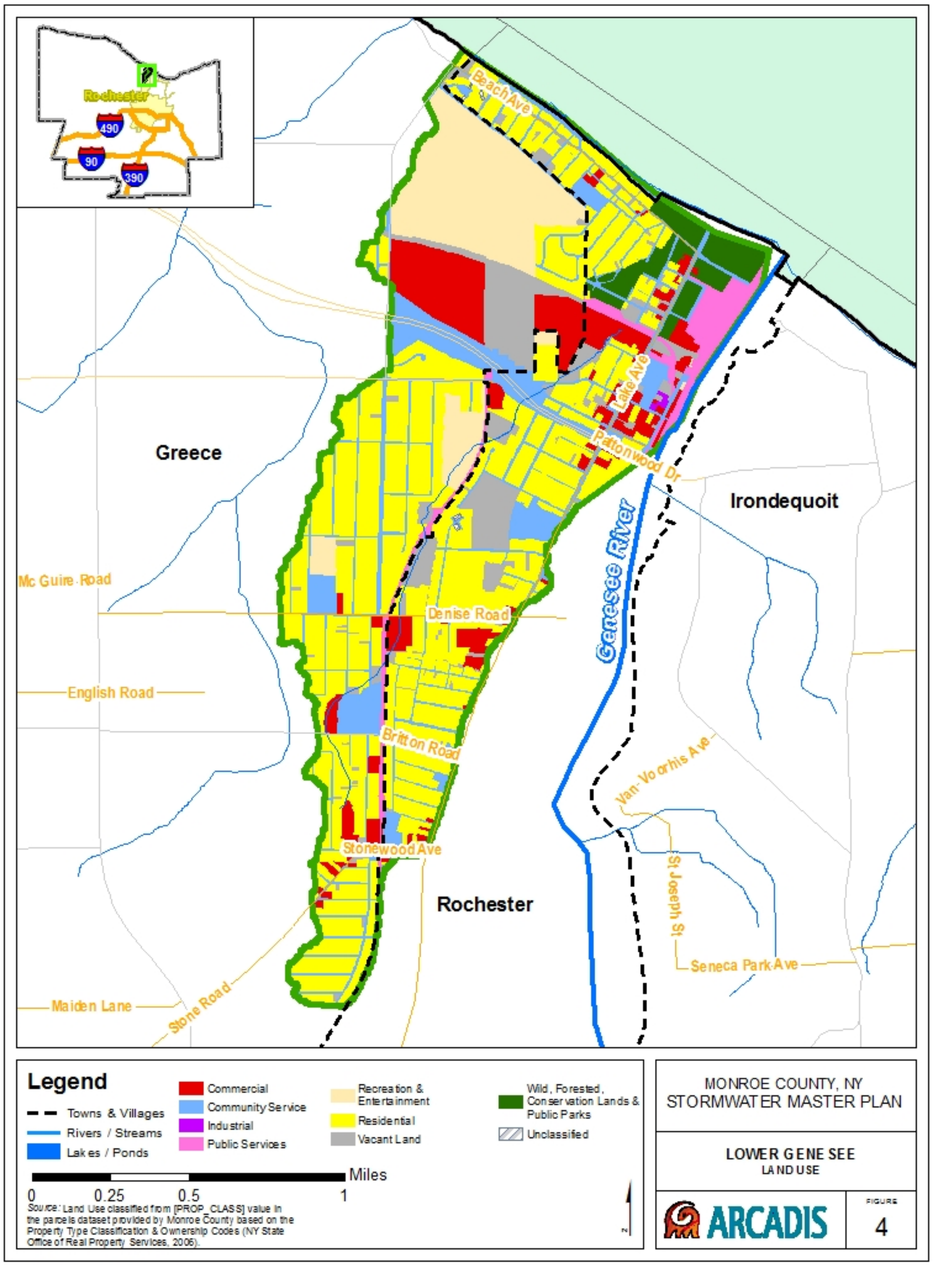

Figure 4 **Land Use within the Lower Genesee River Study Subarea (Source: Monroe County Parcels GIS Dataset)**

1.4 Watershed Characteristics

1.4.1 Water Quality Concerns

An 11.7-mile segment of the Genesee River, from its mouth upstream to the New York State Barge Canal (Erie Canal) is “known” to be impaired for fish consumption and aquatic life designated uses and suspected to be impaired for public bathing designated use (NYSDEC 2003). Other designated uses including recreation and aesthetics are known to be stressed. Water quality pollutants of concern in the Genesee River study area include nutrients, priority organics (PCBs), pesticides, pathogens, silt and sediment, aesthetics, oil and grease from industrial, municipal, toxic/contaminated sediment, storm sewers and urban runoff (NYSDEC 2003). Other suspected pollutants are water levels/flow, metals and salts. Sources of these suspected pollutants are upstream agriculture, combined sewer overflows and landfill disposal, and possibly hydro-modification and streambank erosion (NYSDEC 2003).

The proposed projects identified in this study are not mandatory, but are being proposed proactively by Monroe County together with the members of the Monroe County Stormwater Coalition to improve water quality. The Genesee River is also listed in Appendix 2 of the NYS SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s) because urban stormwater has been identified as a source of pollutants causing the impairment. The General Permit requires that MS4s insure no net increase of pollutants of concern to Appendix 2 waterbodies. Monroe County and the City of Rochester own or operate storm sewers within the Genesee River study area. This plan will help the MS4s identify projects that could be implemented as part of a strategy for complying with the no net increase requirement.

One active USGS gage is located 0.5 miles downstream from the Middle Genesee River study subarea on the Genesee River in the City of Rochester (USGS 04231600 Genesee River at Ford Street Bridge, Rochester, NY) (Figure 5). The gage receives drainage from approximately 2,474 square miles from the greater Genesee River watershed. According to the 2014 Water Data Report for this gage published by the USGS, annual mean discharge for water year 2014 is 3,182 cubic feet per second (cfs) and for water years 1904 through 2014 annual mean discharge is 2,826 cfs. Annual mean discharge ranged from a low of 1,662 cfs to a high of 4,398 cfs. Monthly mean discharge ranges from 1,032 cfs (August) to 6,116 cfs (March). The Erie Canal crosses the river 1.8 miles upstream from the USGS gage. Water diverted by the Erie Canal from Lake Erie is discharged into the Genesee River from the west, and the Erie Canal again diverts a smaller amount of water from the Genesee River to the east. Additional regulation is provided by Rushford Lake, Mount Morris Lake (station 04224000), and Conesus Lake (station 04227980) (USGS 2014).

One historical USGS gage (USGS 04232000 Genesee River at Rochester, New York) operated from April 1904 through September 2005, approximately 5 miles upstream of the Lower Genesee study subarea (Figure 6). This gage had a drainage area of 2,482 square miles and an annual mean discharge of 3,181 cfs for Water Year 2005. Annual mean discharge recorded for this gage ranged from a maximum of 4,426 cfs in Water Year 1978 to a minimum of 1,663 cfs in Water Year 1999.

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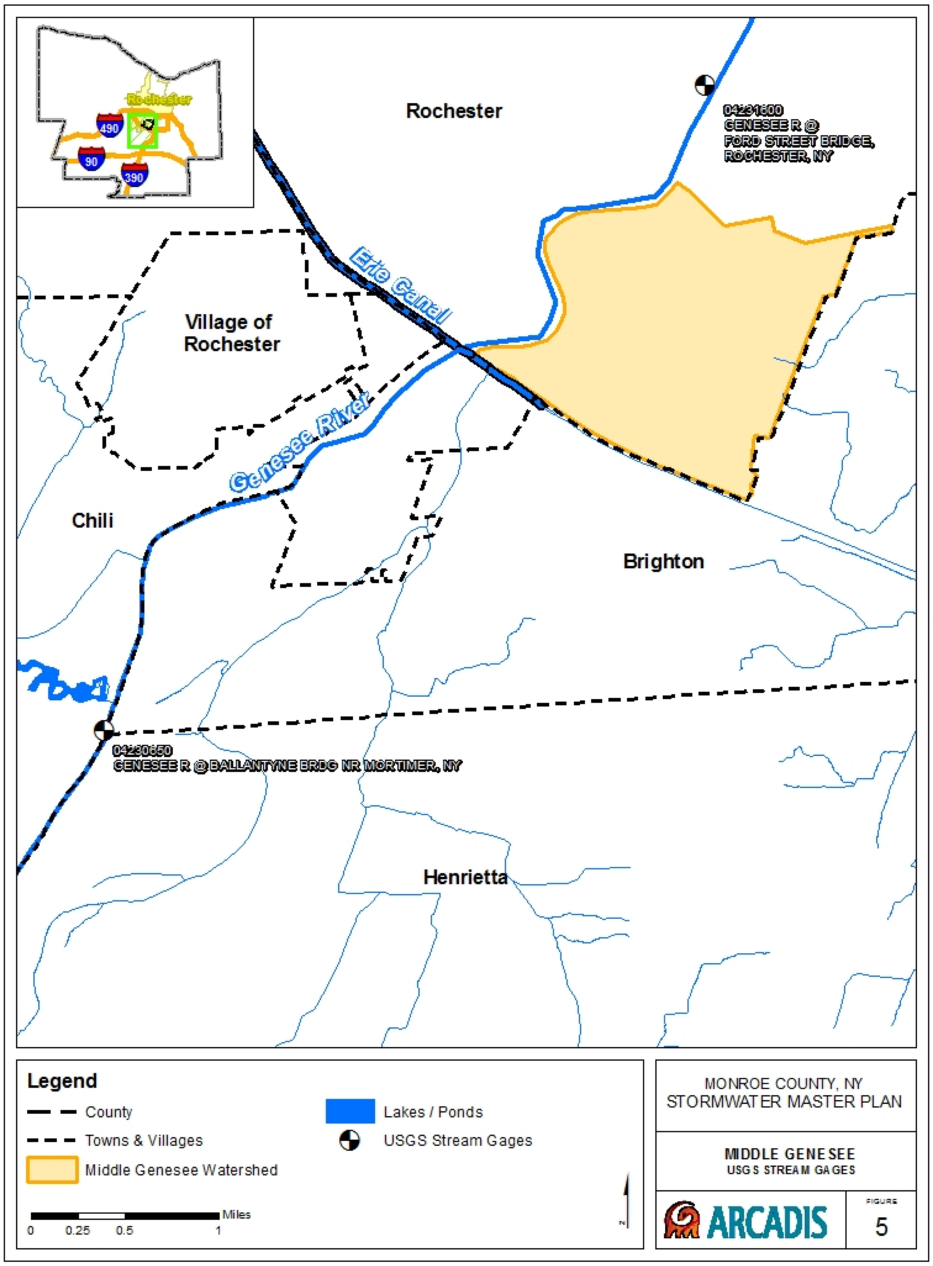

Figure 5 USGS Gaging Station near the Middle Genesee River Study Subarea

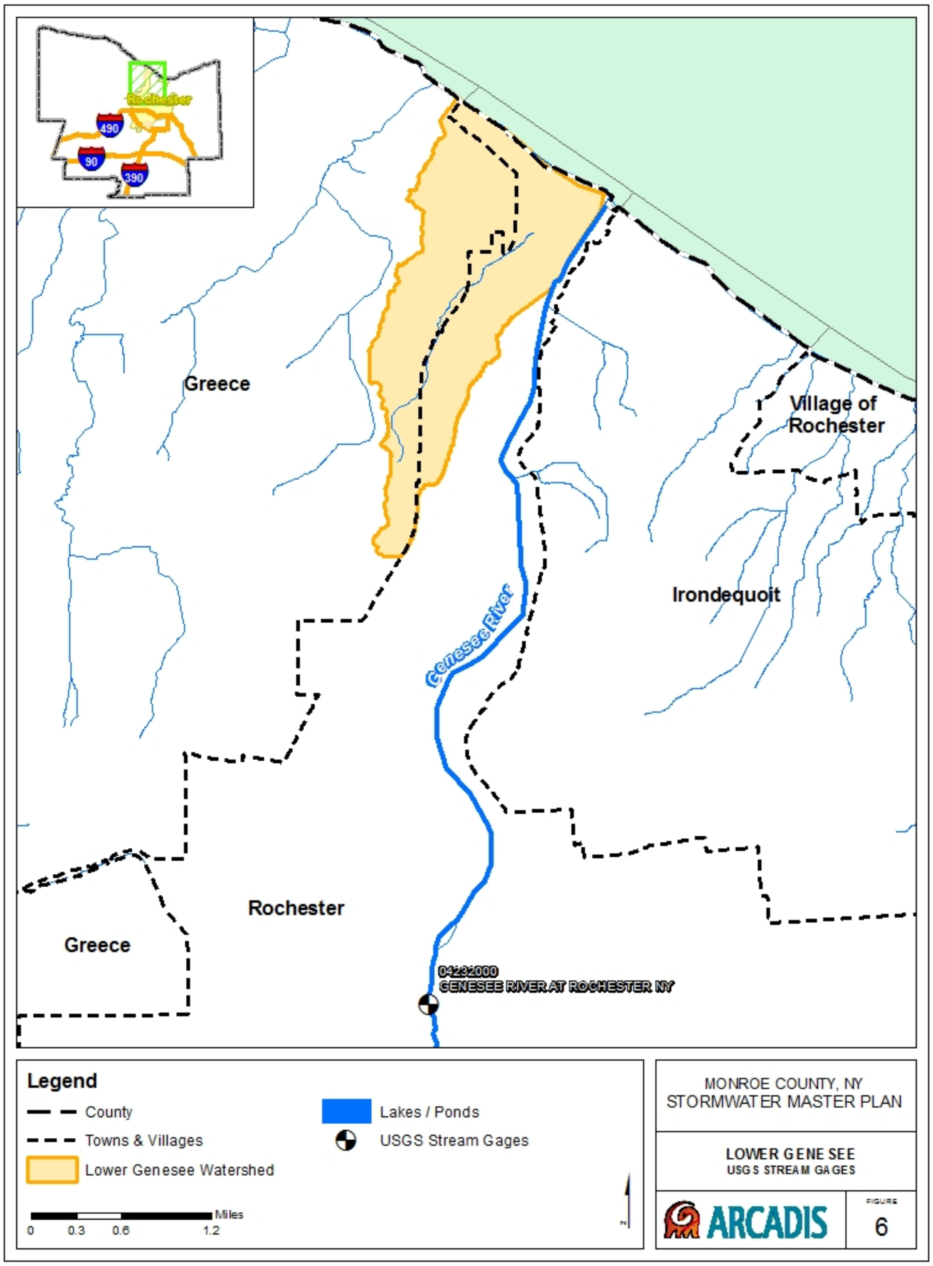

Figure 6 Historical USGS Gaging Station near the Lower Genesee River Study Subarea

1.4.2 Impervious Cover Analysis

Impervious cover is concentrated in both subareas of the Genesee River study area (Figures 7 and 8). Potential retrofit projects are located, to the extent possible, downstream of stormwater outfalls prior to discharging into the Genesee River. In addition, potential bioretention projects, including integrated bioretention systems are sited in areas dominated by impervious cover, such as portions of the University of Rochester campus located in the Middle Genesee subarea of the study area, to improve stormwater infiltration and reduce surface runoff.

The Center for Watershed Protection (CWP) developed an Impervious Cover Model (ICM) to predict the degree of impairment associated with varying proportions of watershed impervious cover (Figure 9). Applying the total percent impervious surface for Genesee River study area, 53%, to the ICM yields a prediction of “non-supporting” for stream quality conditions.

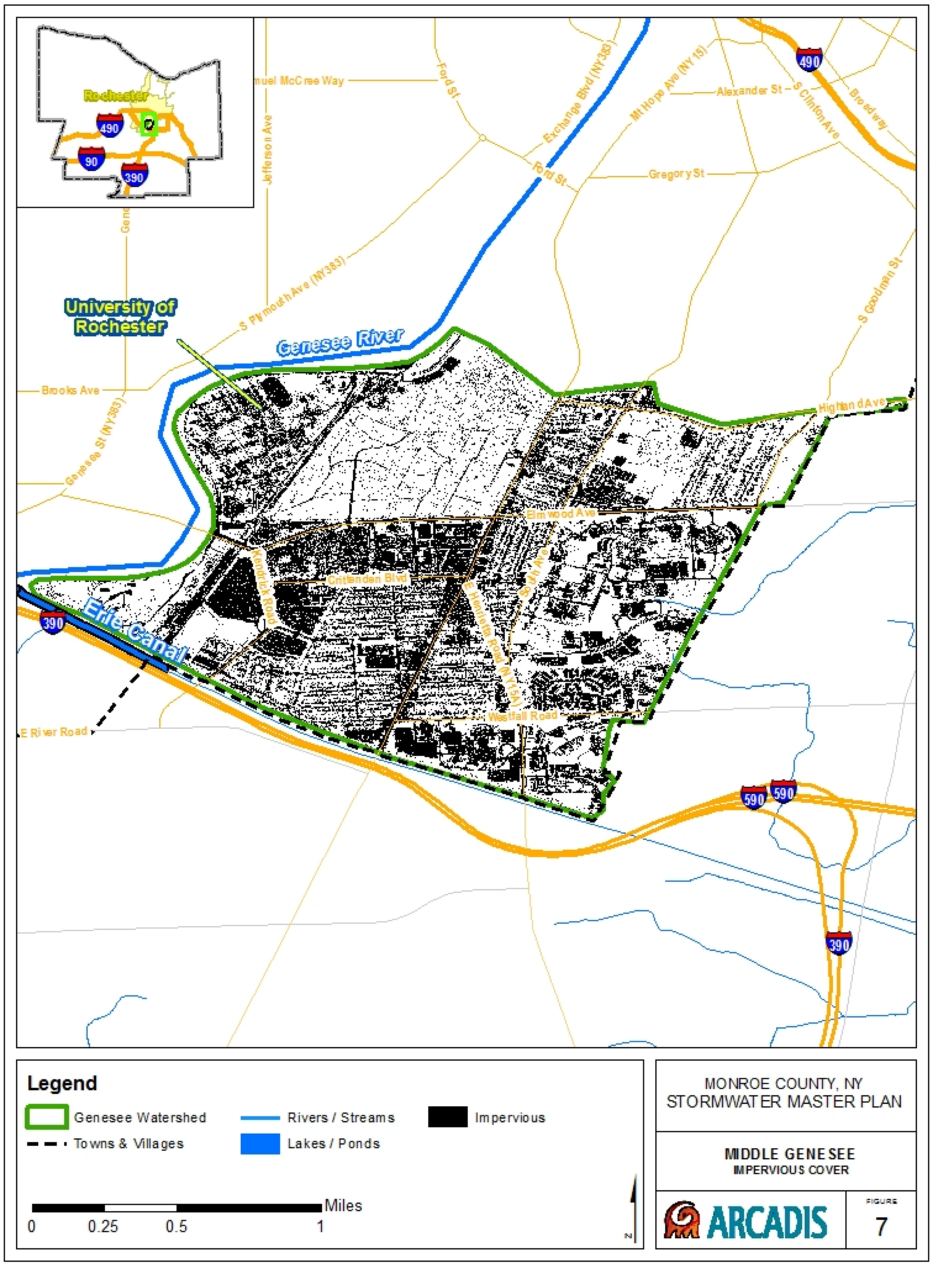

Figure 7 Impervious Cover in Middle Genesee River Study Subarea

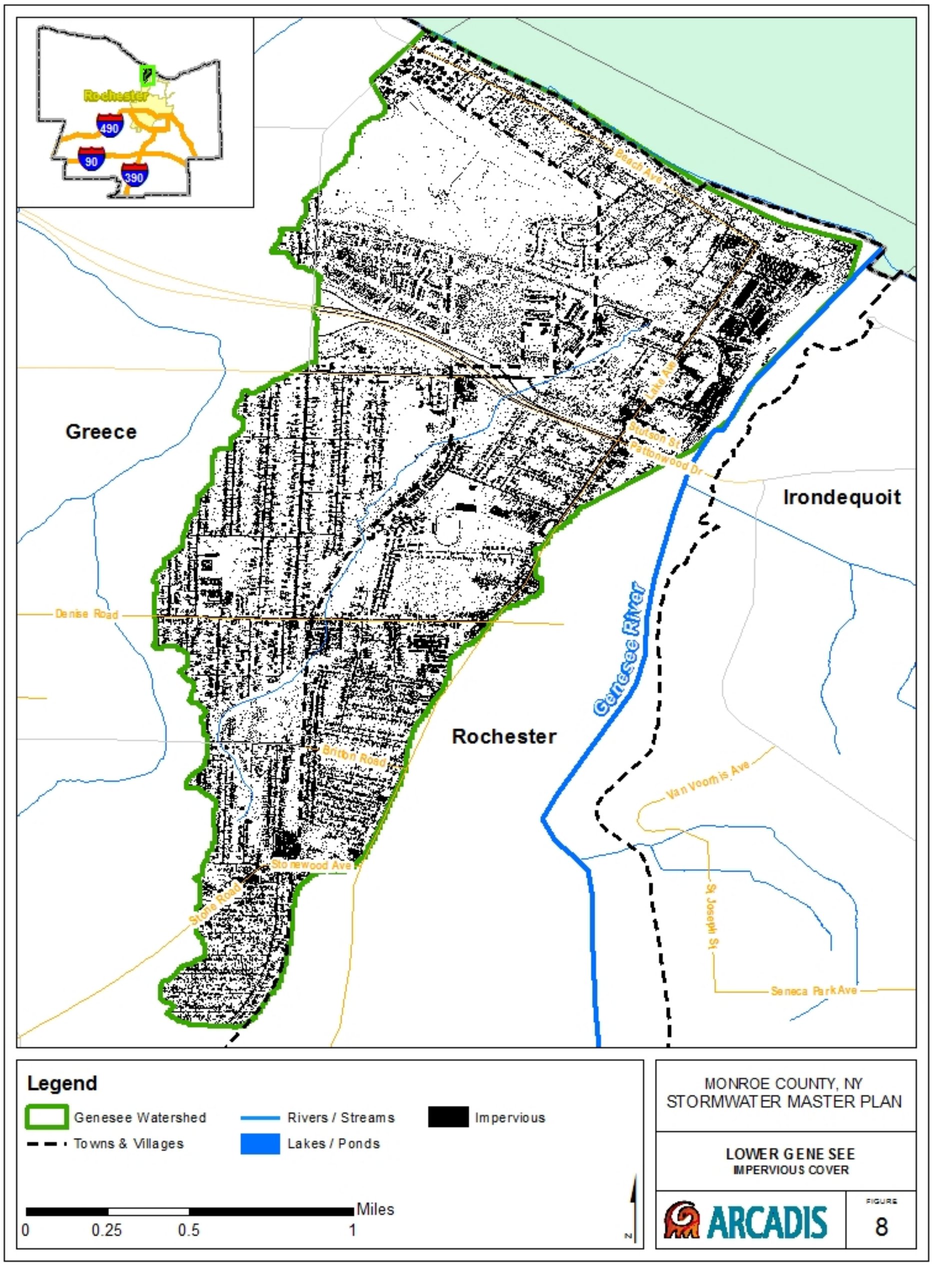

Figure 8 Impervious Cover in Lower Genesee River Study Subarea

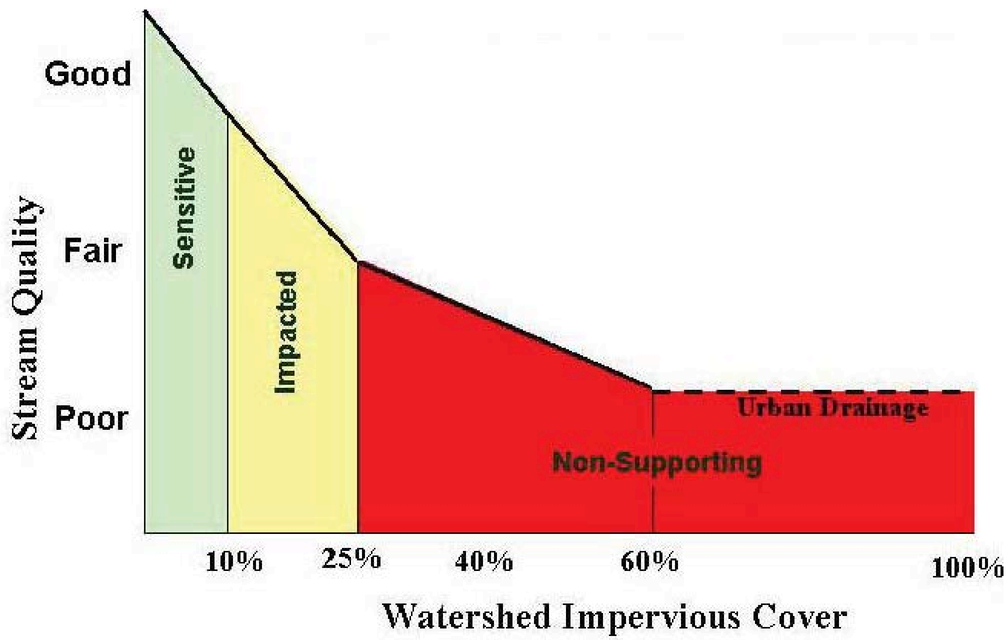

Figure 9 Impervious Cover Model (Center for Watershed Protection)

1.4.3 Drainage Concerns

The effective floodplain maps for the Genesee River and for the City of Rochester were reviewed to identify existing flood-prone areas within the study area. The Mount Morris Dam constructed in 1952 and operated by the Buffalo District USACE serves to protect the City of Rochester along the Genesee River from flooding. No significant flooding within the study area was observed.

1.4.4 Streambank Erosion

Streambank erosion occurs throughout the greater Genesee River watershed in areas with disturbed soil and where forested or vegetated riparian buffers are scarce. Sediment from this streambank erosion becomes suspended in the river flow and is transported downstream. Such sediment is documented as a source of pollution and a surrogate for other pollutants like nutrients (NYSDEC 2003). Streambank erosion has been noted in the Genesee River study area, typically downstream of major roadways and stormwater outfalls. In some of these areas, erosion has been controlled with shoring structures like rip-rap. As part of this assessment, potential streambank erosion areas were identified by reviewing recent aerial photographs. These areas are shown in Figure D-1 in Appendix D.

1.4.5 Soil

A custom Soil Survey Report was generated for the Genesee River study area and is included in Appendix E. Most of the soils in the study area (53.6%) are classified as “urban lands” and lack detailed soil profiles because they have been anthropogenically manipulated over time with urban development.

According to the Soil Survey Report, the Genesee River study area is comprised of about 54% urban land soils, 15% Collamer silt loams on 2 to 6% slopes and about 9% of Hilton loam soils on 3 to 8% slopes and about 9% Ontario loam soils on 3 to 8% slopes. Urban land soils have been heavily manipulated by development and; therefore, lack detailed profiles in the soil survey report. Soils in these areas should be assessed on site as necessary as part of evaluations subsequent to this study. In general, the Collamer silt loam, Hilton loam and Ontario loam soils are moderately well to well drained and have depths to the water table ranging from 18 to 46 inches. Collamer silt loams typically have high available water storage in their profiles (about 10.2 inches), and the Hilton and Ontario loam soils have moderate water storage (about 7.1 to 7.6 inches, respectively) in their profiles.

Most of the soils in the study area are unclassified in terms of Hydrologic Soil Group (HSG) classification (Figures 10 and11). In the Middle Genesee subarea, 78% of soils are unclassified for HSG and for the Lower Genesee subarea 55% are unclassified. After unclassified, the next most prevalent HSG are Group C soils, which are relatively poorly drained and not ideal for promoting stormwater infiltration. Group B soils, which are more well drained than Group C soils, account for 9% of the soils in the Middle Genesee subarea and about 3% of the soils in the Lower Genesee subarea.

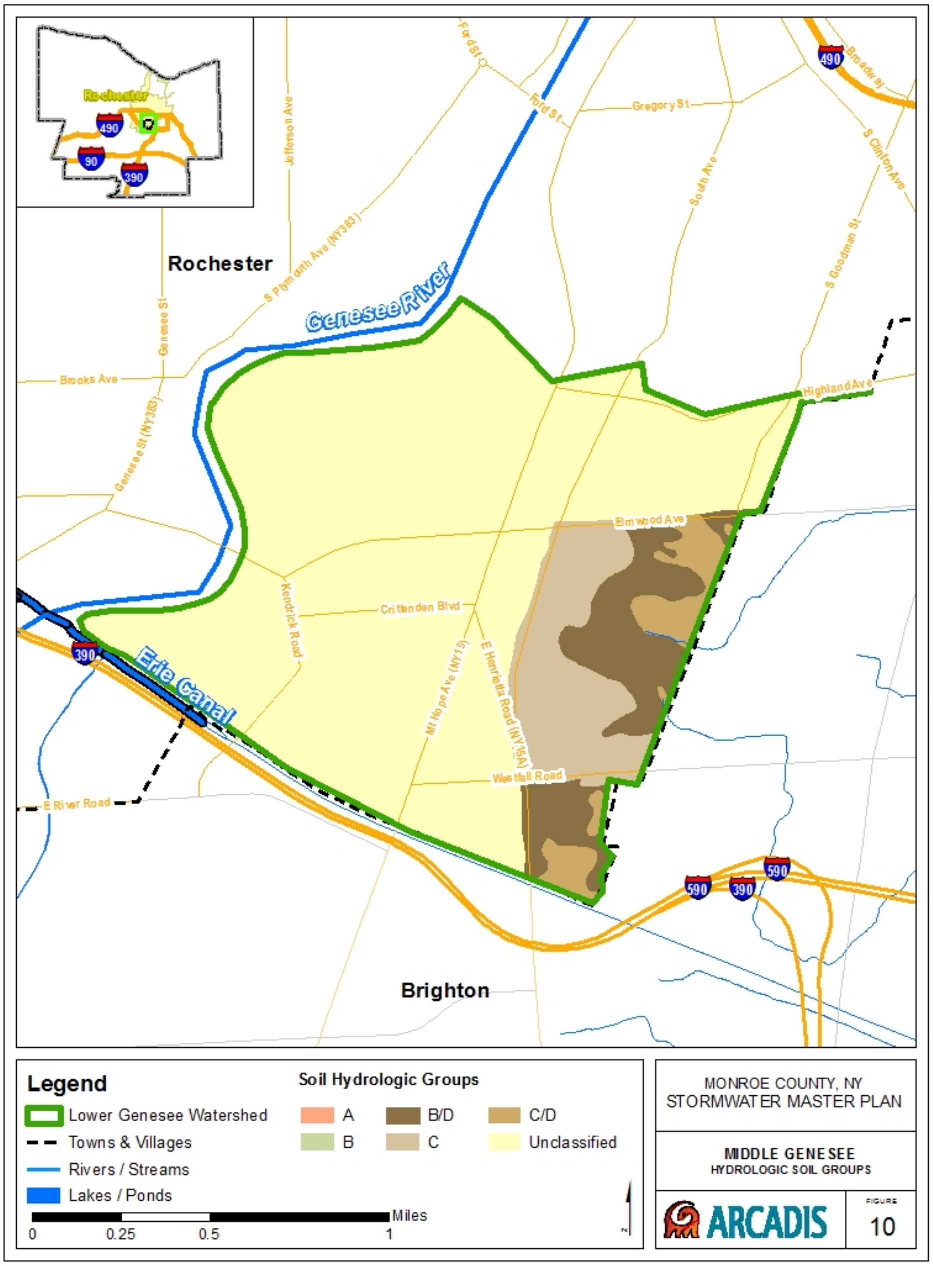

Figure 10 Hydrologic Soil Groups within Middle Genesee River Study Subarea

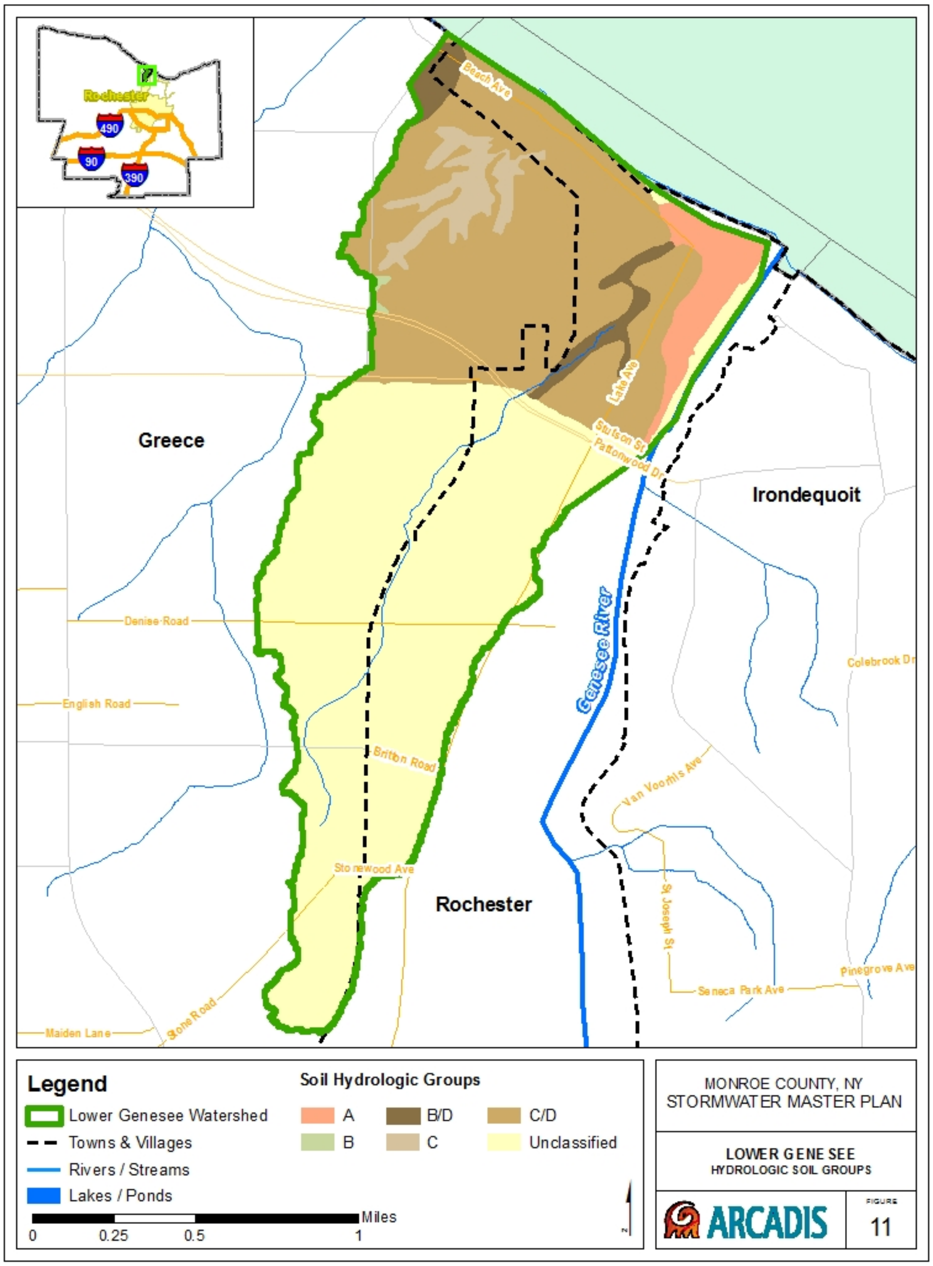

Figure 11 Hydrologic Soil Groups within Lower Genesee River Study Subarea

2. Retrofit Ranking Inventory

2.1 Approach

Potential retrofit project types identified and selected for the assessment of the Genesee River include bioretention areas (within public highway rights-of-way and parking lot areas of impervious cover), integrated bioretention treatment systems, constructed/enhanced wetlands, forested riparian buffers, and stormwater wet pond retrofits (Figures 12 and 13). Design sheets for these stormwater retrofit projects from the CWP Urban Subwatershed Restoration Manual No. 3 (CWP 2007) are included in Appendix F. Potential retrofit projects identified during the GIS reconnaissance are prioritized according to scores calculated for each individual project based on metrics for feasibility, watershed benefits, and cost-effectiveness criteria as explained in the Retrofit Assessment Methodology, Project Type Descriptions, and Retrofit Ranking Criteria (Monroe County, NY 2013), which serves as a reference document for the Monroe County Stormwater Master Plan (Monroe County 2013). These ranking criteria and their associated metrics are summarized below and in Table 2:

- *Feasibility*. The maximum number of points awarded to potential projects for feasibility is five. Points were awarded to projects based on whether the potential project is located mostly on publicly owned land, commercial land, or residential land with Homeowners Associations, and whether the land is undeveloped, zoned for commercial land use, and easily accessed (i.e., easement or within a public right-of-way).

- *Watershed Benefits*. Projects are assigned points for watershed benefits based on calculations of the projects' available flood storage capacity, channel protection volume, and water quality volume targets. If the available flood storage of a project was greater than the computed water quality volume, the channel protection volume or the sum of the computed channel protection and water quality volumes, then the project received a point for flood storage. The target storage for channel protection is about 60% of the 1-year, 24-hour storm runoff volume. The normal target for water quality is to capture and treat the 90% storm (CWP 2007). In addition, points were awarded to projects located in areas of expected infiltration (HSG Classes A and/or B) and whether the projects are considered a potential opportunity for public education and/or community revitalization.

- *Cost Effectiveness*. Projects are assigned points for cost effectiveness based on planning-level cost estimates that consider retrofit project type and drainage area to the project. Unit costs described in the CWP Manual for all project types except forested riparian buffers were applied to estimate planning-level construction cost. Forested riparian buffer planning-level construction costs were estimated using unit costs developed from recent analysis conducted by Virginia Polytechnic Institute and State University, Forest Resources and Environmental Conservation Department and presented in the current version of the peer reviewed journal of Ecological Restoration (Guillozet, P. et al. 2014)

Cost estimates did not consider the cost of land acquisition or ongoing maintenance. Projects with an estimated low cost and high degree of watershed or community benefits (see Table 3) received the highest number of points, while projects estimated to be a high cost with a low benefit were assigned the lowest points.

Table 2 Ranking Protocol (Monroe County 2013)

Project Type	Feasibility	Watershed Benefits	Cost Effectiveness	Maximum Possible Score
New or Retrofit Stormwater Management Ponds	**New Projects** Vacant Public Lands = 4 points; Other Public Lands = 3 points; Projects on commercial property or HOA = 2 points; Ease of access = 1 additional point ***5 possible pts.*** *(Or)* **Upgrades to Existing SW Facilities** On public land = 4 points; On private land with easement = 2 points; Ease of access = 1 additional point ***5 possible points***	Infiltration = 2 points; Flood storage = 1 point; Water quality = 1 point; Channel projector = 1 point; Education = 1 point ***6 possible points***	3 points = $1-11, 2 points = $12-25 1 point = ≥$26 Note: new ponds = New Storage ***3 possible points***	14
GI on Public Highways	1. Planned Road Reconstruction = 5 points 2. Area within ROW is: • vacant/unused paved = 3 points • lawn = 2 points • In use by adjacent business = 1 point 3. Average number of Property Owners – • 1 property owner per 125 or more linear feet = 2 points • Greater than 1 property owner per 125 feet = 1 point ***5 possible points***	Infiltration = 2 points A or B soil types = 1 point; Water quality = 1 point; Channel protection = 1 point; Education = 1 point; Source control = 1 point ***8 possible points***	3 points = $1-11, 2 points = $12-25 1 point = ≥$26 based on table ***3 possible points***	16

Table 2 Ranking Protocol (Monroe County 2013)

Project Type	Feasibility	Watershed Benefits	Cost Effectiveness	Maximum Possible Score
Neighborhood GI	Neighborhoods considered meet these criteria and receive 1 point each: • Neighborhood was built in 1975 or before whose stormwater is not being treated with any management practice. • Average property size is 10,000 SF or larger but is less than 1 acre. • A, B, or C soil type ***2 points***	Community revitalization = 1 point; Water quality = 1 point; Education = 1 point; Source control = 1 point ***4 points***	Neighborhood GI practices vary in cost effectiveness from a score of 3 to 1; therefore, average with 2 points each ***2 points***	8
Other GI Retrofits	Vacant Public lands = 4 points; Other Public Lands = 3 points; Projects on commercial property or HOA = 2 points; Ease of access = 1 additional point ***5 possible points***	Same as GI on public highways ***8 possible points***	Same as above ***3 possible points***	16

Once scores for each of the above metrics were computed, the metric scores were summed for each project to give an overall score for each project. Projects were then ranked based on their total overall score, where the project with the highest number of points was ranked highest and the project with the lowest number of total points was ranked lowest.

2.2 Results

Potential retrofit projects received total scores ranging from five to 13. Two bioretention projects within the Lower Genesee study subarea within public rights-of-way adjacent to highways (ROW-11 and ROW-12) ranked the highest (each had a total score of 13 points. After the two top-ranked ROW projects, one additional bioretention project within the Middle Genesee study subarea on a public right-of-way adjacent to a highway (ROW-3) had the next highest rank, with a total score of 12 points. Six projects each received a total score of 11 points and these project types included four additional bioretention within public rights-of-way (ROW-5, ROW-6, ROW-7 and ROW-8) and two other green infrastructure projects (OGI-1 and OG-2).

Projects that ranked the lowest (each received a total of five points) included three bioretention projects, one of which is located in the Middle Genesee subarea (Bio-2) and two of which are located in the Lower Genesee subarea (Bio-7 and Bio-9). The aforementioned projects ranked low because each project received only one point for feasibility because of their locations on private property and only one point for watershed benefits, specifically for adequate water quality volume.

One noteworthy project type presented in the results is integrated bioretention systems. These projects represent a series of bioretention or green infrastructure projects to infiltrate stormwater runoff and remove pollutants. These projects are often more effective at stormwater infiltration and pollutant removal because the technologies act in series and provide more opportunities for infiltration and pollutant removal. Four of these project types (BioTS-1, BioTS-2, BioTS-8 and BioTS-9) located in the Middle Genesee subarea ranked high (each had a total score of 10 points) relative to all other projects.

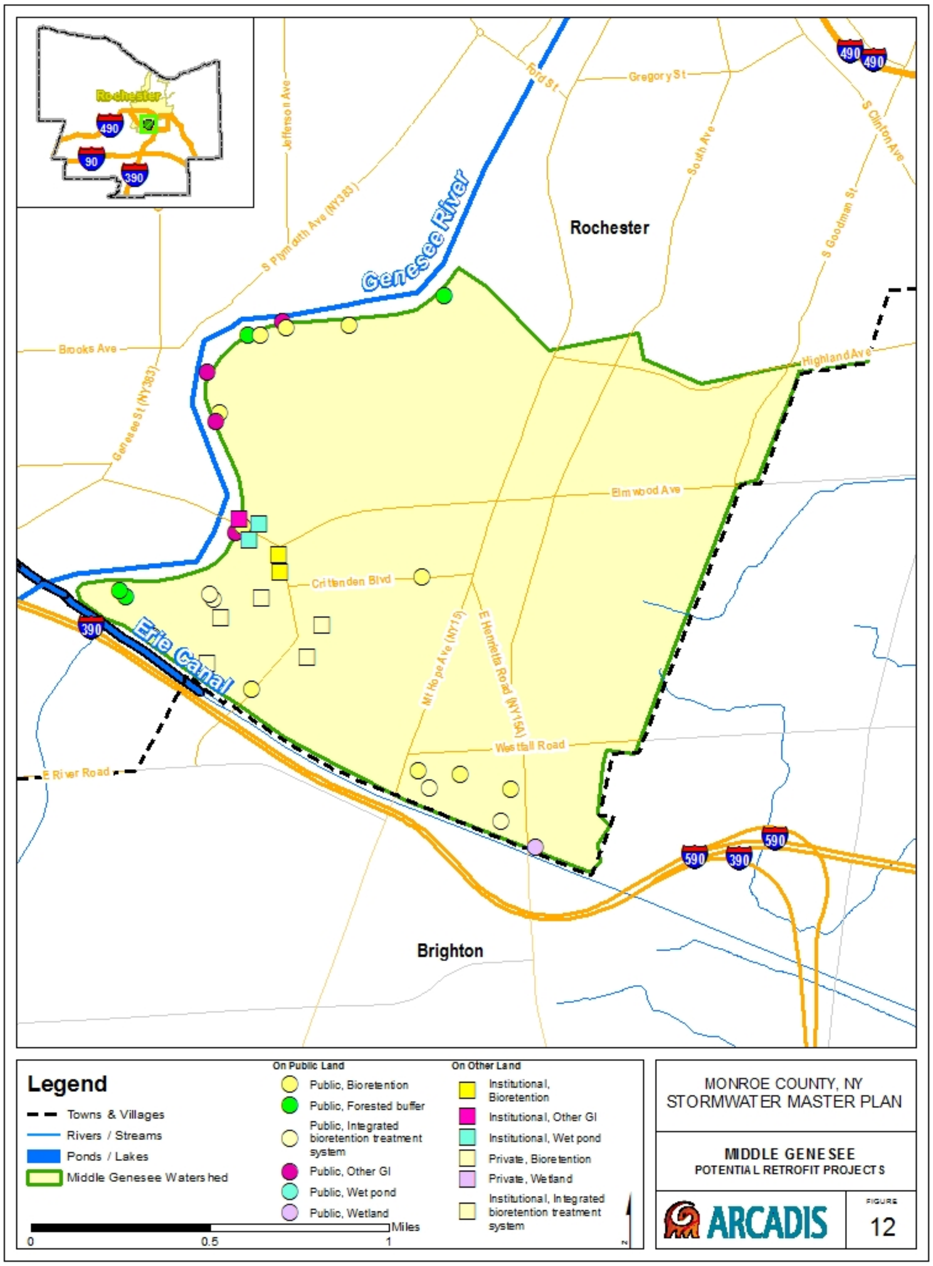

Figure 12 Potential Project Sites within the Middle Genesee River Study Subarea

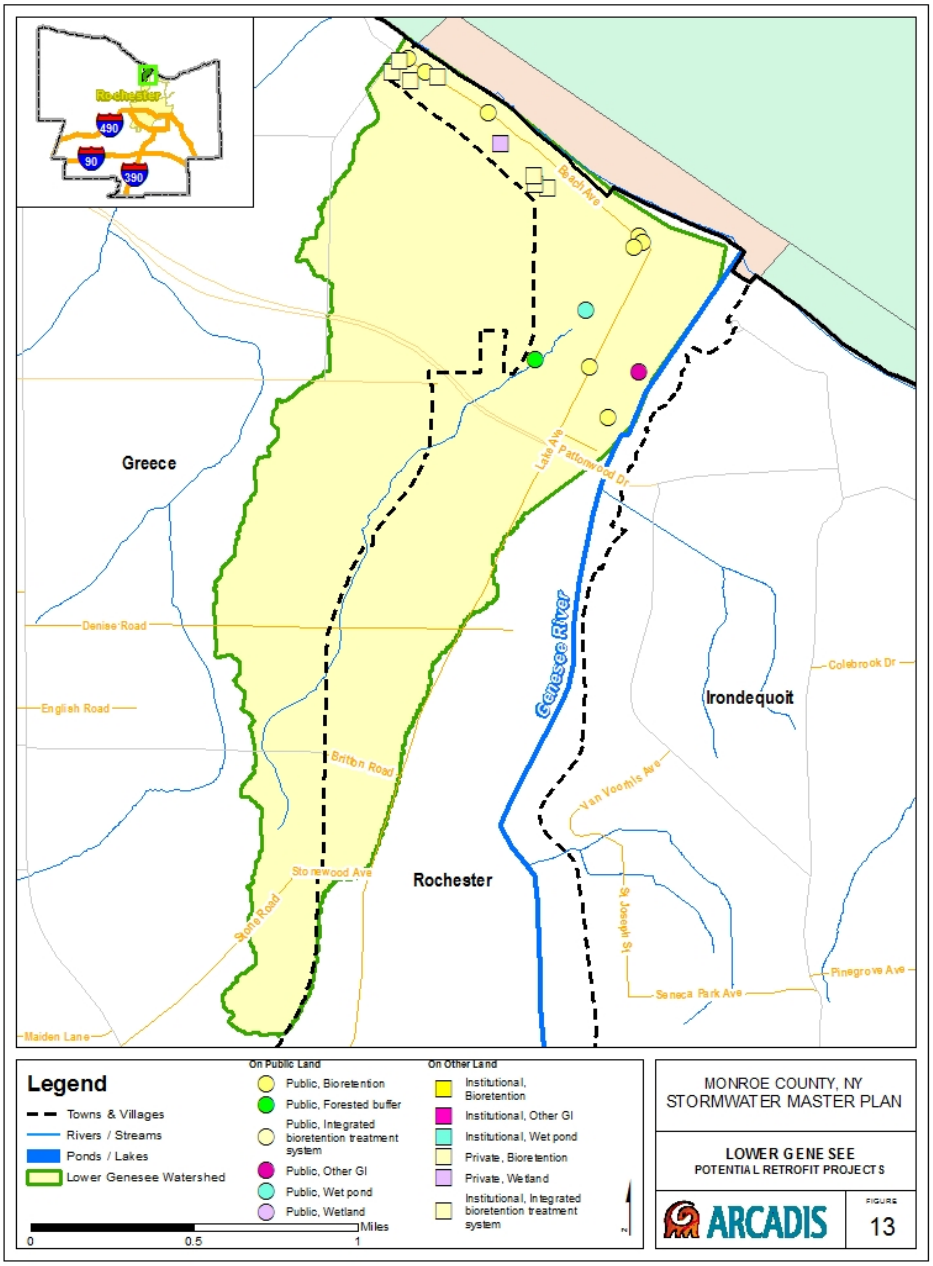

Figure 13 Potential Project Sites within the Lower Genesee River Study Subarea

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Table 3 Ranked Potential Projects

Study Subarea	Project ID	Category	Feasibility	Watershed Benefits	Cost Effectiveness	Total Score
Lower Genesee	ROW-11	Bioretention ROW	4	6	3	13
Lower Genesee	ROW-12	Bioretention ROW	4	6	3	13
Middle Genesee	ROW-3	Bioretention ROW	5	4	3	12
Middle Genesee	ROW-5	Bioretention ROW	4	4	3	11
Middle Genesee	ROW-6	Bioretention ROW	4	4	3	11
Middle Genesee	ROW-7	Bioretention ROW	4	4	3	11
Lower Genesee	ROW-8	Bioretention ROW	4	4	3	11
Middle Genesee	OGI-1	Other GI	4	4	3	11
Middle Genesee	OGI-2	Other GI	4	4	3	11
Middle Genesee	Bio-1	Bioretention	4	3	3	10
Middle Genesee	ROW-1	Bioretention ROW	5	2	3	10
Middle Genesee	ROW-2	Bioretention ROW	5	2	3	10
Middle Genesee	ROW-4	Bioretention ROW	4	3	3	10
Middle Genesee	Buff-1	Forested buffer	4	3	3	10
Middle Genesee	Buff-3	Forested buffer	4	3	3	10
Middle Genesee	Buff-4	Forested buffer	4	3	3	10
Middle Genesee	Imp-1	Impervious cover reduction (Bioretention)	4	3	3	10
Middle Genesee	Imp-2	Impervious cover reduction (Bioretention)	4	3	3	10
Middle Genesee	Imp-3	Impervious cover reduction (Bioretention)	4	3	3	10
Middle Genesee	BioTS-1	Integrated bioretention treatment system	4	3	3	10
Middle Genesee	BioTS-2	Integrated bioretention treatment system	4	3	3	10

Study Subarea	Project ID	Category	Feasibility	Watershed Benefits	Cost Effectiveness	Total Score
Middle Genesee	BioTS-8	Integrated bioretention treatment system	4	3	3	10
Middle Genesee	BioTS-9	Integrated bioretention treatment system	4	3	3	10
Middle Genesee	OGI-3	Other GI	4	3	3	10
Lower Genesee	Bio-10	Bioretention	4	2	3	9
Lower Genesee	Bio-13	Bioretention	3	3	3	9
Lower Genesee	ROW-10	Bioretention ROW	4	2	3	9
Middle Genesee	OGI-4	Other GI	4	2	3	9
Middle Genesee	OGI-5	Other GI	4	2	3	9
Lower Genesee	Bio-11	Bioretention	3	2	3	8
Lower Genesee	Bio-12	Bioretention	3	2	3	8
Middle Genesee	Wtlnd-1	Constructed wetland	4	1	3	8
Middle Genesee	Buff-2	Forested buffer	4	3	1	8
Lower Genesee	Buff-5	Forested buffer	5	0	3	8
Lower Genesee	OGI-6	Other GI	4	1	3	8
Middle Genesee	Bio-3	Bioretention	1	3	3	7
Lower Genesee	Bio-4	Bioretention	4	0	3	7
Lower Genesee	Bio-5	Bioretention	4	0	3	7
Lower Genesee	Bio-6	Bioretention	4	0	3	7
Lower Genesee	ROW-9	Bioretention ROW	4	0	3	7
Middle Genesee	BioTS-3	Integrated bioretention treatment system	1	3	3	7
Middle Genesee	BioTS-4	Integrated bioretention treatment system	1	3	3	7
Middle Genesee	BioTS-5	Integrated bioretention treatment system	1	3	3	7

Study Subarea	Project ID	Category	Feasibility	Watershed Benefits	Cost Effectiveness	Total Score
Middle Genesee	BioTS-6	Integrated bioretention treatment system	1	3	3	7
Middle Genesee	BioTS-7	Integrated bioretention treatment system	1	3	3	7
Middle Genesee	Wet-1	Wet pond	1	3	3	7
Middle Genesee	Wet-2	Wet pond	1	3	3	7
Lower Genesee	Bio-8	Bioretention	3	0	3	6
Lower Genesee	Wtlnd-2	Enhanced wetland	0	3	3	6
Lower Genesee	Wet-3	Wet pond	0	3	3	6
Middle Genesee	Bio-2	Bioretention	1	1	3	5
Lower Genesee	Bio-7	Bioretention	1	1	3	5
Lower Genesee	Bio-9	Bioretention	1	1	3	5

2.3 Top-Rated Retrofit Project Diagrams

Potential retrofit projects are shown individually on diagrams included in Appendix G. Each diagram includes the project name, project identification number, summary of the watershed benefits (per Monroe County Assessment Methodology), project footprint, parcel boundaries, hydrology, stormwater infrastructure, and surrounding roadways.

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